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A study to assess the readiness of rice farmers to use agricultural technology for production in Nong Khai Province, Thailand

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Abstract

This article aims to study the attitude factors affecting the intention to use agricultural technology in the production of rice by farmers in Nong Khai province through a technology acceptance model based on structural equation analysis. Nong Khai, one of the provinces located in Thailand's north-eastern region, has the largest rice production area. The area is suited for agriculture due to its proximity to significant water sources, such as the Mekong River. In this research, data were collected from a group of rice farmers in Nong Khai Province to study the readiness of the sample group that affected the intention to use Amino-KP 2 instead of chemical fertilizer. It was found that there was the highest level of acceptance or intention to use an interpretation of the meaning. The results of all hypothesis testing showed that optimism and interest in innovation influence perceived usefulness and perceived ease of use. The perceived usefulness factor was hindered by the insecurity variable, while the perceived ease of use factor was unaffected. Additionally, the discomfort of using technology hindered the perceived ease of use factor, but the perceived usefulness remained unaffected. The perceived ease of use factor was also found to have a positive influence on the perception of usefulness. Perceived usefulness and perceived ease of use both had a positive influence on the intention to use Amino-KP 2.

Keywords: Agricultural technology, Aminano-KP 2, Attitude, GMS, Intention, Nong Khai.

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1. Introduction

In Thailand, agriculture is fundamental to the Thai economy. A significant proportion of the population has worked in agriculture from the past until the present because of the suitability of the land [1]. The average export value, which exceeds ten billion baht annually, shows that producing agricultural goods in Thailand generates a sizable income for the country. However, exports have declined recently, largely because of the agricultural policies of the nation and its competitors and because Thailand has higher agricultural prices than its competitors. Thailand's exports are impacted by policies like Vietnam's decision to switch to other crops and restrict rice planting areas to reduce surplus output while encouraging farmers to concentrate on producing high-quality rice for export [2]. However, it was also discovered that Thailand's agriculture still has a lot of issues, particularly regarding productivity, which is still rather low. The output was out of proportion to market demand, and typical farm income was low. Given the importance of these problems, the government has started a variety of initiatives to continuously support agriculture. Among such initiatives are large-scale agricultural projects. With the intention of lowering production costs to boost the competitiveness of agricultural goods, the management of agrarian land to develop large-scale farming has been encouraged, whereby key organizations collaborate to carry out the development from upstream to downstream. There is a strategy to manage the land to obtain advantages in accordance with the potential of each area [3]. Collaboration amongst farmers to combine plots to produce more competitive agricultural goods is vital for the success of these large-scale agricultural projects. Acceptance of such a plan and adapting to a new agricultural process are examples of such collaboration. If such acceptability is achieved, integration will follow in the future.

Thailand is a nation in Southeast Asia with a total area of 513,115 square kilometers, It is located in the heart of the Indochina Peninsula (which consists of Myanmar, Thailand, Laos, Vietnam, and Cambodia). Thailand's Nong Khai Province is in the North-east and is 615 kilometers from Bangkok. It covers an area of 3,026.53 square kilometers and is situated in the Mekong River Valley, which serves as the nation's border with the Lao People's Democratic Republic (Laos). Most of the area is flat and 200 meters above sea level (Figure 1) [4]. Consequently, Nong Khai Province is a region that is appropriate for agriculture, and the Nong Khai model project has been both promoted and supported. This is a similar effort to the government's large-scale agricultural project that focuses on systematic agricultural production support and bringing farmers' groups together to increase the power of trade negotiations. Additionally, the Nong Khai Model Project has studied an agricultural product called "Aminano-KP 2," which is produced by using natural materials such as coffee grounds, tea waste, sugarcane cake, animal dung, etc. to ferment until minerals are obtained that can be used as a fertilizer that is suitable for all plant species and can be used at all stages of plant growth, from planting to the accelerated stage. As a result, fewer chemicals are used, which is safer for both growers (producers) and consumers. When the use of chemical fertilizers is minimized, more profit is made since chemical fertilizers are a high-priced production input. As a result, Nong Khai Province can serve as a suitable educational model. Furthermore, Thailand's north-eastern region has the largest rice production area, at 36,878,181 rai, and the area is suited for agriculture due to its proximity to significant water sources such as the Mekong River.

All of the information and reasons mentioned above lead to the study of the causal relationship between rice farmers' readiness and their intention to use agricultural technology in the agricultural production of Nong Khai Province, Thailand. The objective of this research is to study the factors affecting farmers' intentions to use agricultural technology to produce rice in Nong Khai Province. This will lead to support for the adoption of sustainable agricultural technology in production and will encourage agricultural integration to develop cooperation in large-scale agricultural projects in accordance with the government's goals.

2. Scope of the Research

In this study, the researchers identified the population sample as rice farmers in Nong Khai Province during the production years 2020–2021. On the topic of production and utilization of agricultural technologies, the technology used in this study is Aminano-KP 2, a product of the Nong Khai Model Project. It has been developed to encourage farmers to utilize it in place of chemical fertilizers. Amino-KP 2 is a natural product that is produced by the fermentation of natural materials such as coffee grounds, tea leaves, sugarcane cakes, animal dung, etc. to extract various nutrients crucial for plant growth from the time of planting until the accelerated stage of plant growth, when it may be utilized by all kinds of plants. As a result, fewer chemicals are used, which is safer for both growers (producers) and consumers.

3. Conceptual Framework

The Technology Acceptance Model (TAM), the Technology Readiness Index (TRI), and the Technology Readiness and Acceptance Model (TRAM) were used to develop the model for this study. The Technology Readiness and Acceptance Model (TRAM) was first developed by Lin and researchers in 2005 and integrates each personality type in the TRI theory with the TAM model to explain how various perspectives or attitudes affect emotions, experiences, and technological use [5] Figure 2.

Figure 1.
Location of Nong Khai Province, Thailand.
Note: WorldAtlas [6] and Krainara and Routray [7].

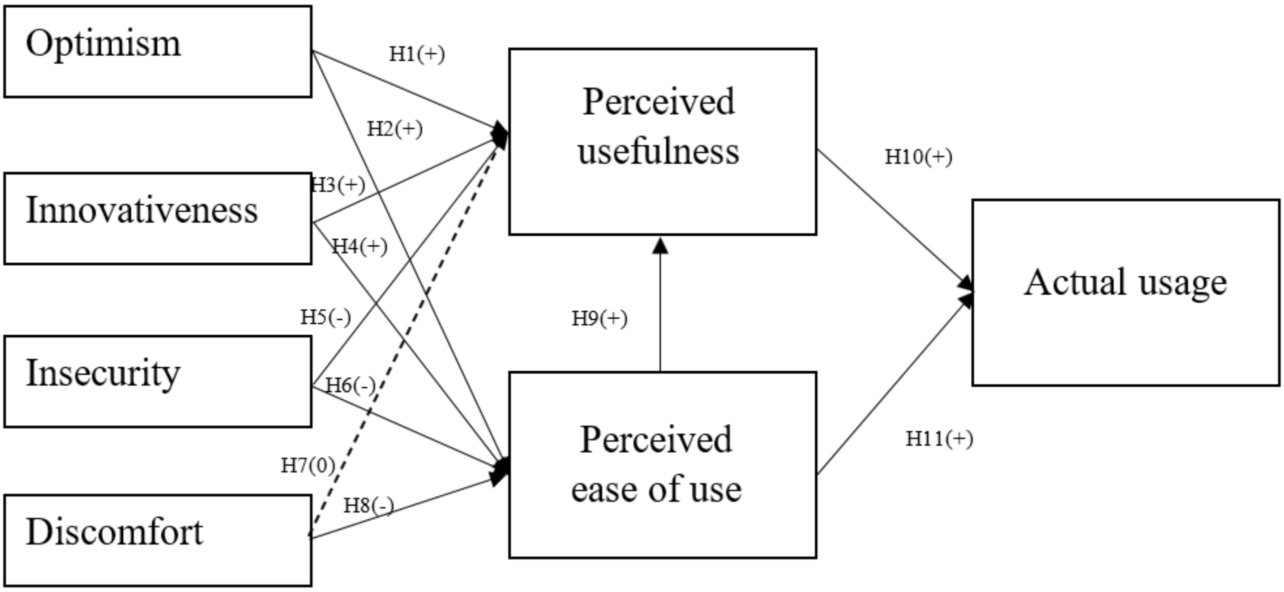

Figure 2.
The farmer's production technology acceptance model developed as a conceptual framework.
Note: Walczuch, et al. [8].

There were seven latent variables in the model that served as the study's framework (Figure 1), and these variables can be divided into categories as follows: Perceived usefulness, perceived ease of use, and actual usage are variables obtained from the Technology Acceptance Model (TAM), whereas optimism, ininnovativeness, insecurity, and discomfort are variables applied from the Technology Readiness Index (TRI) concept [8].

A structural equation model (SEM) is used to estimate relationships in the conceptual framework, with the analysis utilizing the Maximum Likelihood Estimation (MLE) method. This study frequently necessitates model modification to accord with the theoretical and empirical data, which may be checked against the set threshold [9]. The steps of the structural equation model were divided into two parts: (1) the measurement model, a model for measuring latent variables with observed variables as part of the confirmatory factor analysis, and (2) the structural model, a model for path analysis to determine the causal relationship between endogenous and internal latent variables [10].

4. Hypothesis

To show the link between the variables in the models and hypotheses. The following assumptions represent the relationships between variables in the Technology Readiness and Acceptance Model (TRAM) model (Table 1).

Table 1.
Hypothesis.

Hypothesis	Description		
	Variable	**Effect**	**Variable**
1	Optimism	Positive	Perceived usefulness.
2	Optimism	Positive	Perceived ease of use.
3	Innovativeness	Positive	Perceived usefulness.
4	Innovativeness	Positive	Perceived ease of use.
5	Insecurity	Negative	Perceived usefulness.
6	Insecurity	Negative	Perceived ease of use.
7	Discomfort	Unaffected	Perceived usefulness.
8	Discomfort	Negative	Perceived ease of use.
9	Perceived ease of use	Positive	Perceived usefulness.
10	Perceived usefulness	Positive	Actual usage or Intention to use.
11	Perceived ease of use	Positive	Actual usage or Intention to use.

5. Methodology

A quantitative field studies survey provided the information used in the study. The data were gathered via a questionnaire.

5.1. Population and Sample

The population studied in this study is rice farmers in Nong Khai Province, and the sample size should be 20 observations on 1 independent variable [11, 12], which was recommended to be suitable for estimation via structural equation modeling (SEM). As a result, the conceptual framework identified 23 observed variables among the latent variables as independent variables. The minimal sample size is 23x20 = 460 samples; however, 512 samples are utilized to assure the accuracy of the computations, evaluate the completeness of the questions and to examine the nature of the data distribution (normality) by removing questionnaire items with anomalous data. The study was performed between September and November 2021.

5.2. Data Collection and Tools

The research tool used for data collection was a questionnaire created in accordance with the conceptual framework and split into two parts: 1) the sample's personal information; and 2) the data covering opinions or attitudes in different areas that were determined based on the variables in the TRAM model, which included seven areas in total: (1) Farmers' optimism (optimism); (2) Farmers' interest in innovation initiatives (innovativeness); (3) Farmers' insufficient confidence in agricultural technologies (insecurity); (4) Uncomfortable use of technology (discomfort); (5) Perceptions on how simple technology is to be used (perceived ease of use); (6) Perception of the advantages of technology (perceived usefulness); and (7) Intention to Use Agricultural Technology (actual usage), which were assessed using a Likert scale [13].

Determining content validity using the index of item-objective congruence (IOC) of three experts is therefore required to create a research instrument. According to the evaluation's findings, the value was not less than 0.50 but was in the range of 0.67 and 1.00.

The survey is thus appropriate for usage [14]. 30 individuals made up the sample used to examine the questionnaire's reliability (reliability test). The reliability test findings fell within the range of 0.723–0.897, which is above the acceptability criterion for Cronbach's alpha of 0.70 or above [15].

5.3.Data Analysis Data pppl

(1) Preliminary data analysis considers the variables and fundamental statistics, including correlation, skewness, kurtosis, and the frequency, percentage, mean, and standard deviation.

The researcher established the mean interpretation criterion for the variables evaluated in Table 2.

Table 2.
Interpretation criteria.

Mean	Interprets
4.50-5.00	Strongly agree / Very important
3.50-4.49	Agree / Important
2.50-3.49	Undecided / Moderately important
1.50-2.49	Disagree / Slightly important
1.00-1.49	Strongly disagree / Unimportant

Note: Al-Tamimi and Shuib [16].

(2) Next, after we tested the preliminary data results. We employ Structural Equation Modeling (SEM) analysis: The following statistics were used to verify whether the developed models could validate their conformance with the surveyed data and to analyze the factors influencing the desire to apply agricultural technology to rice growing in Nong Khai Province. The statistics used for testing were as follows: 1) The chi-square value is non-significant; hence, the p-value must be higher than 0.05. 2) The Chi-Square ratio must be higher than 3.00. 3) The goodness-of-fit index (GFI) must be higher than 0.90. 4) The adjusted goodness-of-fit (AGFI) must be higher than 0.90. 5) The root mean square error (RMSEA) must be less than or equal to 0.08. 6) The root mean square residual (RMS) must be lower than 0.08. 7) The Comparative Fit Index (CFI) ranges from 0.95 to 1.00, and 8) the Tucker-Lewis Index (TLI) ranges from 0.95 to 1.00 [11, 17].

6. Results

6.1. General Information about the Sample Group

The majority of the sample farmers (74.22%) were men. The average age of the farmers was 54 years old, which was found to be indicative of their readiness to pass on their firms to the next generation or heir. The oldest farmer was 65 years old and demonstrated that being a farmer has no upper age restriction but is subject to the need for a certain level of physical fitness as a self-employed worker.

Most of the sample group had completed elementary school education, and the average number of years of experience in farming was 25.60, or around 26. On average, about two workers were employed to produce rice. In terms of average monthly income, it was found that farmers made 26,468.669 Thai Baht on average per month (Table 3).

Table 3.
General information about the sample group.

General information	Number (People)	Percent
Gender		
Male	380	74.22
Female	132	25.78
Age (Years) ($\bar{X}$ =54.041, $S.D.$=10.657)		
Under 21	5	0.98
21 – 30	12	2.34
31 – 40	45	8.79
41 – 50	137	26.76
51 - 60	163	31.84
61and over	150	29.29
Education		
Uneducated	4	0.78
Elementary school	317	61.91
Secondary school	138	26.95
Undergraduate degree	51	9.96
Postgraduate degree	2	0.40
Experience (Years) ($\bar{X}$ =27.502, $S.D.$=11.831)		
Under 10	43	8.40
11 - 20	165	32.23
21 - 30	152	29.69
31 - 40	92	17.97
Over40	60	11.71
Labor (People) ($\bar{X}$ =1.941, $S.D.$=0.702)		
1	142	27.73
2	258	50.39
3	112	21.88
Household income (Thai Baht/Month)($\bar{X}$ =26,468.669, $S.D.$= 14,227.747)		
≤ 10,000	48	9.38
10,001 - 20,000	115	22.46
20,001 - 30,000	159	31.05
30,001 - 40,000	110	21.48
> 40,000	80	15.63

6.2. The Attitude Level in Different Aspects of the Sample Group

According to the findings (Table 4), farmers' attitudes at the strongest level (strongly agree) were for the following: optimism ($\bar{X}$=4.672), interest in innovation ($\bar{X}$=4.504), lack of confidence in the safety of agricultural technology (insecurity) ($\bar{X}$=4.597), and intention to use agricultural technology (actual usage) ($\bar{X}$=4.666). Farmers' attitudes toward technology were at a high level (agree) for: discomfort with its usage (discomfort) ($\bar{X}$= 4.487), perceived ease of use (perceived ease of use) ($\bar{X}$= 4.443), and perceived utility (perceived usefulness) ($\bar{X}$= 4.344), and the standard deviation was between 0.41 and 0.56, with a value of less than 1 suggesting a moderately distributed set of data [18].From the results, it could be inferred that farmers want to employ Aminano-KP 2 at the highest level during the production process or that the sample farmers have good acceptance of agricultural technology.

Table 4.
Levels of the attitude of farmers for the variables.

Variable	Mean	S.D.	Result
Optimism	4.672	0.412	Strongly agree
Innovativeness	4.504	0.537	Strongly agree
Insecurity	4.597	0.458	Strongly agree
Discomfort	4.487	0.510	Agree
Perceived usefulness	4.344	0.565	Agree
Perceived ease of use	4.443	0.530	Agree
Actual usage or intention to use	4.666	0.409	Strongly agree

6.3. Factors Affecting the Intention of the Agriculturalists to use Agricultural Technology

6.3.1. Examining Data Distribution

The researchers looked at skewness and kurtosis, determining that the skewness should be between -2.00 and +2.00 and the kurtosis should be between -7.00 and +7.00 [19]. All variables in this study showed skewnesses between -1.632 and -0.506 and kurtosises between -0.957 and 3.587, suggesting that the data were within the acceptable range (Table 5).

Table 5.
Descriptive statistics.

Elements	Mean	S.D.	Skewness	Kurtosis
Optimism (OPT)	4.672	0.412		
1. You are aware of how farming has been facilitated by agricultural technology. (OPT1)	4.709	0.491	-1.559	2.751
2. You now know that agricultural technology may boost productivity or help you save on expenditures. (OPT2)	4.637	0.497	-0.761	-0.957
3. You are aware that any agricultural procedure takes less time when using agro technology. (OPT3)	4.643	0.533	-1.208	0.918
4. It is known to you that all new agricultural technologies are beneficial. (OPT4)	4.699	0.515	-1.632	2.808
Innovativeness (INN)	4.504	0.537		
1. You keep abreast of new agricultural technology. (INN1)	4.428	0.736	-1.577	3.587
2. You consider it a challenge to learn how to use modern farming technology. (INN2)	4.570	0.558	-1.057	1.265
3. You believe that you will master a new agricultural technique if someone teaches it to you. (INN3)	4.561	0.534	-0.705	-0.207
4. If you use the same agricultural technology, you will probably experience fewer issues than other people. (INN4)	4.459	0.666	-1.162	1.662
Insecurity (INS)	4.597	0.458		
1. When new agricultural technology is required, you become nervous. (INS1)	4.611	0.511	-0.721	-0.880
2. If you utilize improper agricultural technology in the future or have issues, you are likely to feel bad. (INS2)	4.607	0.538	-1.002	0.398
3. If you want to employ agricultural technology, you need to take care to prevent breakdowns or other issues while farming. (INS3)	4.555	0.567	-1.152	2.553
4. Because there is a chance of malfunction or misuse, I feel like I need to use agricultural technology with extra caution. (INS4)	4.613	0.555	-1.353	2.889
Discomfort (DIS)	4.487	0.510		
1. You believe that agricultural technology is hazardous to both you and the produce it generates. (DIS1)	4.607	0.534	-0.899	-0.307
2. You believe that using agricultural technology on your farm is inappropriate. (DIS2)	4.492	0.583	-0.771	0.271
3. You worry that agricultural technology won't produce outcomes that will satisfy your demands. (DIS3)	4.420	0.597	-0.598	0.035
4. Without observable outcomes, you lack the confidence to deploy agricultural technology. (DIS4)	4.430	0.633	-0.844	0.547
Perceived usefulness (PU)	4.344	0.565		
1. You are aware of how simple to utilize and transferable such agro technology is to coworkers in the same field. (PU1)	4.506	0.583	-0.765	-0.067
2. You are aware that conventional agricultural methods may benefit greatly from the application of such agro technology. (PU2)	4.158	0.740	-0.668	0.631
3. You already know that agricultural technology is	4.369	0.663	-0.740	0.163

Elements	Mean	S.D.	Skewness	Kurtosis
simple to comprehend without even attempting to comprehend how to apply it. (PU3)				
Perceived ease of use (PE)	4.443	0.530		
1. You are aware that agro technology can be used to improve the agriculture you now practice. (PE1)	4.432	0.582	-0.506	-0.321
2. You are aware that such agricultural technology can boost production effectiveness. (PE2)	4.375	0.664	-0.756	0.172
3. You are aware that such agro technology can increase the value of crops. (PE3)	4.547	0.554	-0.844	0.483
4. Overall, you consider agro technology to be a valuable technology. (PE4)	4.420	0.620	-0.829	1.206
Intention to use (IU)	4.666	0.409		
1. You are expected to apply such agricultural technologies in the future. (IU1)	4.748	0.465	-1.549	1.341
2. You will pick a crop or a method of production that can be employed with that agro technology. (IU2)	4.691	0.491	-1.175	0.164
3. Technology would be expected to be required in agriculture today. (IU3)	4.559	0.542	-0.678	-0.686

Also, all variables used in the analysis were suitable for the structural equation model because they had a correlation between them that ranged from 0.504 to 0.721 at a significance level of 0.05, which is less than 0.80 [20](Table 6).

Table 6.
Correlations test.

Constructs	OPT	INN	INS	DIS	PU	PE	IU
OPT	1.000						
INN	0.562	1.000					
INS	0.670	0.612	1.000				
DIS	0.644	0.562	0.699	1.000			
PU	0.504	0.571	0.601	0.675	1.000		
PE	0.574	0.619	0.597	0.639	0.600	1.000	
IU	0.721	0.571	0.618	0.618	0.531	0.543	1.000

6.3.2. Confirmatory Factor Analysis (CFA)

CFA is employed to examine whether the observed independent variables are correlated to the same latent variable or not and whether the observation variable is more essential. At this stage, the underweight variables (those weighing less than 0.60) were eliminated [21]. The seven factors of the model were analyzed, and the findings revealed that all requirements were satisfied. It was also found that the value for Average Variance Extracted (AVE) was between 0.547 and 0.673, which is more than 0.50, and that the value for Composite Reliability (CR) was between 0.790 and 0.891. which is more than 0.7 and suggests that the data are suitable [22] (Table 7).

Table 7.
Results for construct validity and the reliability of latent constructs.

Constructs	Items	Factor loading
Optimism (OPT) (CR=0.827, AVE=0.547)	OPT1	0.638
	OPT2	0.774
	OPT3	0.843
	OPT4	0.686
Innovativeness (INN) (CR=0.853, AVE=0.594)	INN1	0.723
	INN2	0.816
	INN3	0.811
	INN4	0.727
Insecurity (INS) (CR=0.888, AVE=0.667)	INS1	0.722
	INS2	0.888
	INS3	0.878
	INS4	0.766
Discomfort (DIS) (CR=0.884, AVE=0.657)	DIS1	0.732
	DIS2	0.854
	DIS3	0.859

Constructs	Items	Factor loading
	DIS4	0.790
Perceived usefulness (PU) (CR=0.810, AVE=0.589)	PU1	0.678
	PU2	0.809
	PU3	0.808
Perceived ease of use (PE) (CR=0.891, AVE=0.673)	PE1	0.793
	PE2	0.879
	PE3	0.818
	PE4	0.788
Intention to use (IU) (CR=0.790, AVE=0.558)	IU1	0.696
	IU2	0.822
	IU3	0.717

6.3.3. Structural Equation Model (SEM)

The goodness-of-fit results from the structural equation model analysis were used to modify the model. It was discovered that the structural equation model was more compatible with the empirical data after model adjustment, taking theoretical feasibility into consideration (Table 8) (Figure 3).

Table 8.
The results of the analysis of data from the index used to examine the concordance and harmony of variables with empirical data.

No.	Indicator	Criterion	Before adjustment		After adjustment	
1	χ^2	$0.05< \rho <1.00$	0.000		0.080	√
2	χ^2 / df	$0.00< \chi^2 / df \leq 3$	1.765	√	1.674	√
3	GFI	$0.90< GFI \leq 1.00$	0.829		0.936	√
4	$AGFI$	$0.90< AGFI \leq 1.00$	0.851		0.919	√
5	$RMSEA$	$0.00\leq RMSEA \leq 0.08$	0.078	√	0.036	√
6	RMR	$0.00< RMR <0.08$	0.052	√	0.012	√
7	CFI	$0.95\leq CFI \leq 1.00$	0.926		0.980	√
8	TLI	$0.95\leq TLI \leq 1.00$	0.920		0.977	√

Note: √ means passing the index test result criteria used to check the consistency and harmony of variables with empirical data. Criteria source: Diamantopoulos and Siguaw [17] and Schumacker and Lomax [11].
Source: Calculated through a statistical program.

6.3.4. Analysis of Influence and Hypothesis Validation

The modified structural equation model (SEM) analysis findings are explained in accordance with each of the following hypotheses: Optimism has a path coefficient value of 0.281 that positively influences perceived usefulness (H1), followed by a path coefficient value of 0.450 that positively influences perceived ease of use (H2). Innovation initiatives (innovativeness) have a positive influence on perceived usefulness, with a path coefficient value of 0.120 (H3), and a positive influence on perceived ease of use, with a positive influence value of 0.463 (H4).The uncertainty of safety (insecurity) negatively influences the perceived usefulness with the path coefficient value of -0.284 (H5), and the uncertainty of safety (insecurity) negatively influences the perceived ease of use with the path coefficient value of -0.163 (H6). However, as the result was statistically insignificant ($p > 0.1$), discomfort had no influence on how usefulness was perceived (H7). Discomfort had a path coefficient value of -0.204 that negatively influenced perceived ease of use (H8), while the path coefficient value of 0.142 positively influenced perceived usefulness (H9). Finally, perceived ease of use had a positive influence on intent to use technology (actual usage) with a path coefficient of 0.321 (H11), after having a positive impact on intent to use technology (actual usage) with a path coefficient of 0.214 on perceived usefulness (H10).The estimated influence value outcomes matched each of the specified hypotheses (Table 9) (Figure 3).

Table 9.
The results of data analysis and hypothesis testing.

Hypothesis/Path diagram	Path coefficients	Hypothesis testing	
		Do not reject	Reject
H1: OPT → PU	0.281***	√	
H2: OPT → PE	0.450***	√	
H3: INN → PU	0.120**	√	
H4: INN → PE	0.463**	√	
H5: INS → PU	-0.284**	√	
H6: INS → PE	-0.163***	√	
H7: DIS - - → PU	-0.197	√	
H8: DIS → PE	-0.204*	√	

Hypothesis/Path diagram	Path coefficients	Hypothesis testing	
		Do not reject	Reject
H9: PE → PU	0.142**	√	
H10: PE → IU	0.321**	√	
H11: PU → IU	0.214**	√	

Note: ***, **, * indicate significant at the P≤0.01, P≤0.05, P≤0.10
→ does cause.
- - → does not cause.

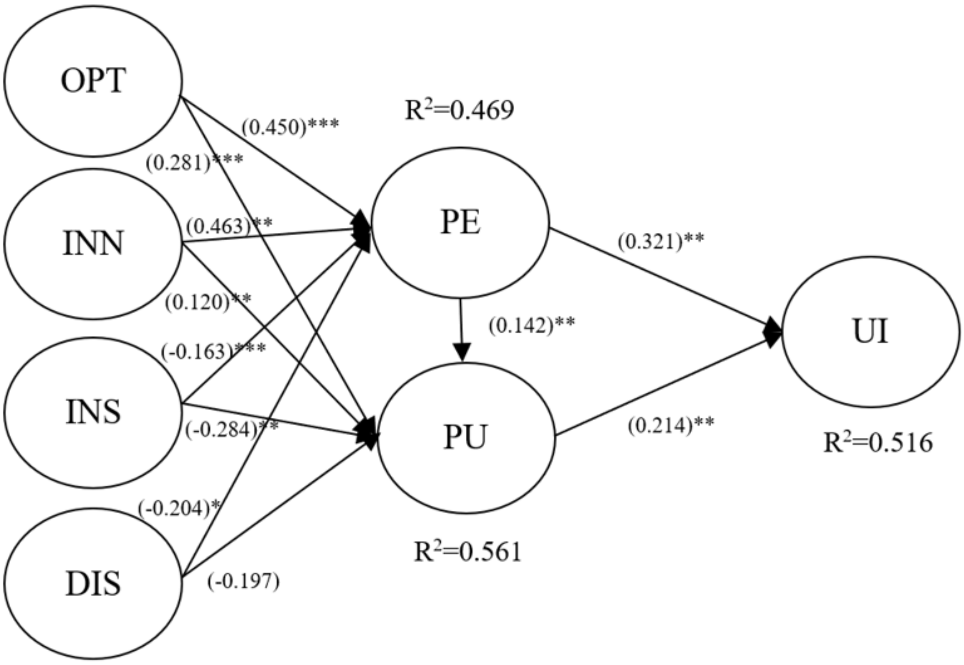

Figure 3. Structural model (Standardized paths) of the total sample.
Note: ( ) is coefficient, he asterisks ***,**,* denote significance at the 1%, 5% and 10% levels of significance from t-statistics, respectively.

7. Conclusion

The aim of this study was to determine whether farmers were willing to adopt agricultural technology in their operations, which in this study was Aminano-KP2, an agricultural technology. The Technology Readiness and Acceptance Model (TRAM) was applied as the conceptual framework, which is based on two theories, TRI and TAM, to provide a research framework on technology readiness for adoption. In this study, data were collected from a sample of rice farmers in Nong Khai province to study how the samples' readiness to use Aminano-KP 2 instead of the farmers' existing fertilizer, with the highest level of acceptance or intention to use it, influences their behavior.

There are a total of seven variables in the conceptual framework of this study, which are broken down into factors that are the key variables. Optimism, interest in innovation (innovativeness), insecurity, and discomfort with technology are the four aspects of technology acceptance. Perceived usefulness and perceived ease of use are the two variables in the middle, and the intention to use (actual usage) was the dependent variable. 512 farmers in the province of Nong Khai were surveyed, and data were gathered through real field visits.

The results of all hypothesis testing showed that optimism and interest in innovation influence perceived usefulness and perceived ease of use. The perceived usefulness factor was hindered by the insecurity variable, while the perceived ease of use factor was unaffected. Additionally, the discomfort of using technology hindered the perceived ease of use factor, but the perceived usefulness remained unaffected. The perceived ease of use factor was also found to have a positive influence on the perception of usefulness. Perceived usefulness and perceived ease of use both had a positive influence on the intention to use Amino-KP 2.

References

[1] K. Thongmeethip, "Agricultural development in Thailand in terms of community development and quality of life," *PSDS Journal of Development Studies, Puey Ungphakorn School of Development Studies, Thammasat University,* vol. 4, no. 1, pp. 132-162, 2021. https://doi.org/10.7763/ijssh.2015.v5.594

[2] Economic News by Prachachat, ""Thai rice export crisis for 15 years, NGO does not work, Vietnam overtakes," Retrieved: https://www.prachachat.net/economy/news-1039908. 2022.

[3] Ministry of Agriculture and Cooperatives, *Operation manual for large-scale agricultural extension systems*. Bangkok: Ministry of Agriculture and Cooperatives, 2022.

[4] Office of the Department of Local Administration Nong Khai Province, "Basic information of Nong Khai Province," Retrieved: https://www.nongkhailocal.go.th/public/basicinformation/data/index/menu/213. 2022.

[5] C. S. Lin, H. Shih, P. Sher, and Y. Wang, "Consumer adoption of e-service: Integrating technology readiness with the technology acceptance model," *Technology Management: A Unifying Discipline for Melting the Boundaries*, pp. 483-488, 2005. https://ieeexplore.ieee.org/document/1509728

[6] WorldAtlas, "Maps of Thailand," Retrieved: https://www.worldatlas.com/maps/thailand. 2022.

[7] C. Krainara and J. K. Routray, "Cross-border trades and commerce between Thailand and neighboring countries: Policy implications for establishing special border economic zones," *Journal of Borderlands Studies*, vol. 30, no. 3, pp. 345-363, 2015. https://doi.org/10.1080/08865655.2015.1068209

[8] R. Walczuch, J. Lemmink, and S. Streukens, "The effect of service employees' technology readiness on technology acceptance," *Information & Management*, vol. 44, no. 2, pp. 206-215, 2007. https://doi.org/10.1016/j.im.2006.12.005.

[9] J. Henseler and M. Sarstedt, "Goodness-of-fit indices for partial least squares path modeling," *Computational Statistics*, vol. 28, pp. 565-580, 2013. https://link.springer.com/article/10.1007/s00180-012-0317-1

[10] K. Kelley, "Methods for the behavioral, educational, and social sciences: An R package," *Behavior Research Methods*, vol. 39, pp. 979-984, 2007. https://doi.org/10.3758/bf03192993

[11] R. E. Schumacker and R. G. Lomax, *A beginner's guide to structural equation modeling*. New York: Psychology Press. https://doi.org/10.4324/9781410610904, 2004.

[12] P. Thaworn, N. Sinnarong, K. Sitthisatikuland, and C. Sumritsakun, "The causal relationship between total quality management and total quality environmental quality management influences corporate sustainability performance of the manufacturing industry in Thailand," *Journal of Liberal Arts and Service Industry*, vol. 5, no. 1, pp. 274-282, 2022.

[13] R. Likert, "A technique for the measurement of attitudes," *Archives of Psychology*, vol. 3, pp. 42-48, 1932.

[14] R. C. Turner and L. Carlson, "Indexes of item-objective congruence for multidimensional items," *International Journal of Testing*, vol. 3, no. 2, pp. 163-171, 2003. https://doi.org/10.1207/S15327574IJT0302_5

[15] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *Psychometrika*, vol. 16, pp. 297-334, 1951. https://doi.org/10.1007/BF02310555

[16] A. Al-Tamimi and M. Shuib, "Motivation and attitudes towards learning English: A study of petroleum engineering undergraduates at Hadhramout university of sciences and technology," *GEMA: Online Journal of Language Studies*, vol. 9, no. 2, pp. 29-55, 2009.

[17] A. Diamantopoulos and J. A. Siguaw, *Introducing LISREL: A guide for the uninitiated*. California: SAGE Publishing. https://dx.doi.org/10.4135/9781849209359, 2000.

[18] W. Thamrongsotthisakul, "Curriculum implementation theory: A rapid call for developing curriculum theory," *Journal of Education Naresuan University*, vol. 19, no. 4, pp. 343–355, 2017. https://so06.tci-thaijo.org/index.php/edujournal_nu/article/view/108553

[19] K. S. Namahoot and T. Laohavichien, "Assessing the intentions to use internet banking: The role of perceived risk and trust as mediating factors," *International Journal of Bank Marketing*, vol. 36, no. 2, pp. 256-276, 2018. https://doi.org/10.1108/IJBM-11-2016-0159

[20] K. Vehkalahti and B. S. Everitt, *Multivariate analysis for the behavioral sciences*. Boca Raton: CRC Press. https://doi.org/10.1201/9781351202275, 2018.

[21] S. McQuitty, "The purposes of multivariate data analysis methods: An applied commentary," *Journal of African Business*, vol. 19, no. 1, pp. 124-142, 2018. https://doi.org/10.1080/15228916.2017.137481

[22] S. Saibuator and K. S. Namahoot, "Patterns of Behavioral acceptance of intentionality in the use of smart applications for health of Gen X," *Srinakharinwirot Business Journal*, vol. 10, no. 2, pp. 78-91, 2019.